

Customer Shopping Behavior Analysis

1. Project Overview

This project examines customer purchasing behavior using transactional data from 3,900 purchases across multiple product categories. The analysis aims to identify spending patterns, customer segmentation, product preferences, and subscription trends to inform data-driven strategic business decisions.

2. Business Questions/Problems

- Q1. What is the total revenue generated by male vs. female customers?
- Q2. Which customers used a discount but still spent more than the average purchase amount?
- Q3. Which are the top 5 products with the highest average review rating?
- Q4. Compare the average Purchase Amounts between Standard and Express Shipping?
- Q5. Do subscribed customers spend more? Compare average spend and total revenue between subscribers and non-subscribers
- Q6. Which 5 products have the highest percentage of purchases with discounts applied?
- Q7. Segment customers into New, Returning, and Loyal based on their total number of previous purchases, and show the count of each segment
- Q8. What are the top 3 most purchased products within each category?
- Q9. Are customers who are repeat buyers (more than 5 previous purchases) also likely to subscribe?
- Q10. What is the revenue contribution of each age group?

3. Dataset Summary

Rows: 3,900

Columns: 18

Key Features: -Customer demographics (Age, Gender, Location, Subscription Status), Purchase details (Item Purchased, Category, Purchase Amount, Season, Size, Color), Shopping behavior (Discount Applied, Promo Code Used, Previous Purchases, Frequency of Purchases, Review Rating, Shipping Type)

Missing Data: 37 values in the Review Rating column

4. Exploratory Data Analysis using Python

We began with data preparation and cleaning in Python:

- Data Loading: Imported dataset using pandas.
- Initial Exploration: Used df.info() to check structure and .describe() for summary statistics.

	Customer ID	Age	Gender	Item Purchased	Category	Total Purchase Amount (USD)	Location	Size	Color	Season	Review Rating	Subscription Status	Shipping Type	Discount Applied
count	3900.000000	3900.000000	3900	3900	3900	3900.000000	3900	3900	3900	3900	3863.000000	3900	3900	39
unique	Nan	Nan	2	25	4	Nan	50	4	25	4	Nan	2	6	
top	Nan	Nan	Male	Blouse	Clothing	Nan	Montana	M	Olive	Spring	Nan	No	Free Shipping	
freq	Nan	Nan	2652	171	1737	Nan	96	1755	177	999	Nan	2847	675	22
mean	1950.500000	44.068462	Nan	Nan	Nan	59.764359	Nan	Nan	Nan	Nan	3.750065	Nan	Nan	Nan
std	1125.977353	15.207589	Nan	Nan	Nan	23.685392	Nan	Nan	Nan	Nan	0.716983	Nan	Nan	Nan
min	1.000000	18.000000	Nan	Nan	Nan	20.000000	Nan	Nan	Nan	Nan	2.500000	Nan	Nan	Nan
25%	975.750000	31.000000	Nan	Nan	Nan	39.000000	Nan	Nan	Nan	Nan	3.100000	Nan	Nan	Nan
50%	1950.500000	44.000000	Nan	Nan	Nan	60.000000	Nan	Nan	Nan	Nan	3.800000	Nan	Nan	Nan
75%	2925.250000	57.000000	Nan	Nan	Nan	81.000000	Nan	Nan	Nan	Nan	4.400000	Nan	Nan	Nan
max	3900.000000	70.000000	Nan	Nan	Nan	100.000000	Nan	Nan	Nan	Nan	5.000000	Nan	Nan	Nan

Discount Applied	Promo Code Used	Previous Purchases	Payment Method	Frequency of Purchases
3900	3900	3900.000000	3900	3900
2	2	Nan	6	7
No	No	Nan	PayPal	Every 3 Months
2223	2223	Nan	677	584
Nan	Nan	25.351538	Nan	Nan
Nan	Nan	14.447125	Nan	Nan
Nan	Nan	1.000000	Nan	Nan
Nan	Nan	13.000000	Nan	Nan
Nan	Nan	25.000000	Nan	Nan
Nan	Nan	38.000000	Nan	Nan
Nan	Nan	50.000000	Nan	Nan

- Missing Data Handling: Checked for null values and imputed missing values in the Review Rating column using the median rating of each product category.
- Column Standardization: Renamed columns for better readability and documentation.
- Feature Engineering: Created age_group column by binning customer ages and purchase_frequency_days column from purchase data.

- Data Consistency Check: Verified if discount_applied and promo_code_used were redundant, and dropped promo_code_used.
- Database Integration: Connected Python script to PostgreSQL and loaded the cleaned DataFrame into the database for SQL analysis.

5. Data Analysis using SQL (Business Transactions)

We performed structured analysis in PostgreSQL to answer key business questions:

Q1. Revenue by Gender – Compared total revenue generated by male vs. female customers.

	gender text 	revenue numeric 
1	Female	75191
2	Male	157890

Q2. High-Spending Discount Users – Identified customers who used discounts but still spent above the average purchase amount.

	customer_id bigint 	purchase_amount bigint 
1	2	64
2	3	73
3	4	90
4	7	85
5	9	97
6	12	68
7	13	72
8	16	81
9	20	90
10	22	62
11	24	69

Total rows: 839 Query complete 00:00:00.133

Q3. Top 5 Products by Rating – Found products with the highest average review ratings.

	item_purchased 	Average Product Rating 
1	Gloves	3.86
2	Sandals	3.84
3	Boots	3.82
4	Hat	3.80
5	Skirt	3.78

Q4. Shipping Type Comparison – Compared average purchase amounts between Standard and Express shipping.

	shipping_type 	round 
1	Standard	58.46
2	Express	60.48

Q5. Subscribers vs. Non-Subscribers – Compared average spend and total revenue across subscription status.

	subscription_status 	total_customers 	avg_spend 	total_revenue 
1	Yes	1053	59.49	62645.00
2	No	2847	59.87	170436.00

Q6. Discount-Dependent Products – Identified 5 products with the highest percentage of discounted purchases.

	item_purchased 	discount_rate 
1	Hat	50.00
2	Sneakers	49.66
3	Coat	49.07
4	Sweater	48.17
5	Pants	47.37

Q7. Customer Segmentation – Classified customers into New, Returning, and Loyal segments based on purchase history.

	customer_segment text	Number of Customers bigint
1	Loyal	3116
2	New	83
3	Returning	701

Q8. Top 3 Products per Category – Listed the most purchased products within each category.

	item_rank bigint	category text	item_purchased text	total_orders bigint
1	1	Accessories	Jewelry	171
2	2	Accessories	Sunglasses	161
3	3	Accessories	Belt	161
4	1	Clothing	Blouse	171
5	2	Clothing	Pants	171
6	3	Clothing	Shirt	169
7	1	Footwear	Sandals	160
8	2	Footwear	Shoes	150
9	3	Footwear	Sneakers	145
10	1	Outerwear	Jacket	163
11	2	Outerwear	Coat	161

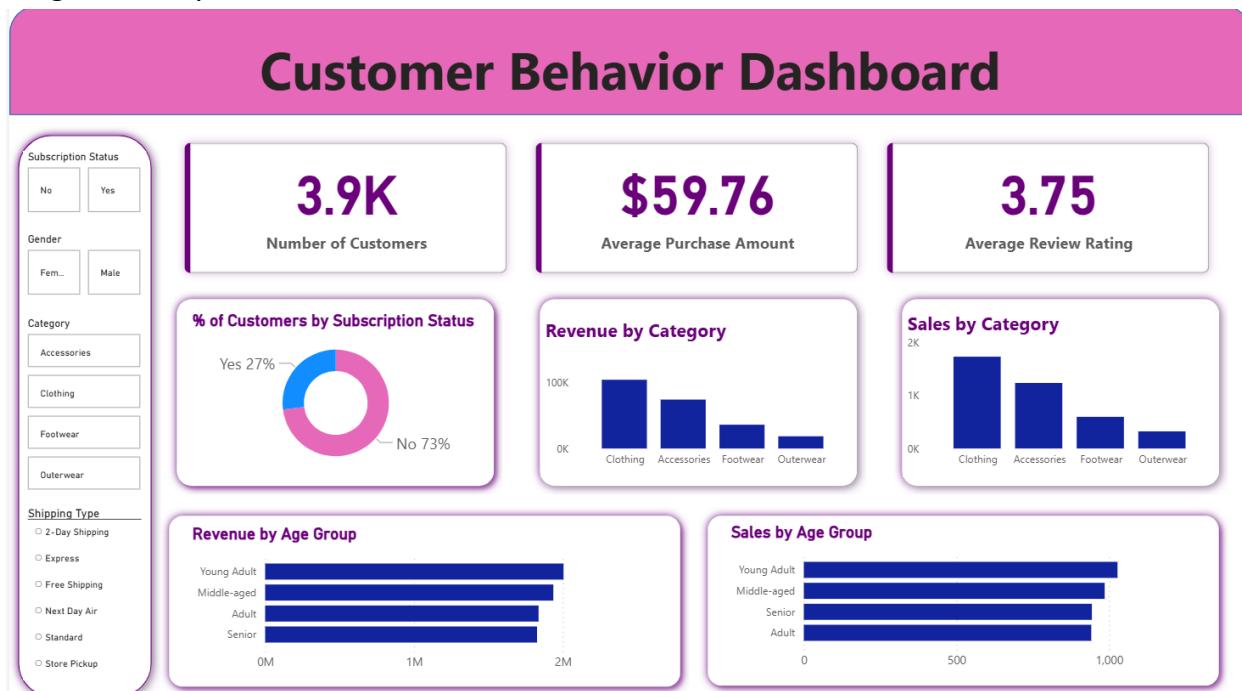
Q9. Repeat Buyers & Subscriptions – Checked whether customers with >5 purchases are more likely to subscribe.

	subscription_status text	repeat_buyers bigint
1	No	2518
2	Yes	958

Q10. Revenue by Age Group – Calculated total revenue contribution of each age group.

	age_group 	total_revenue 
1	Young Adult	62143
2	Middle-aged	59197
3	Adult	55978
4	Senior	55763

6. Dashboard in Power BI Finally, we built an interactive dashboard in **Power BI** to present insights visually.



7. Business Recommendations

- Boost Subscriptions** – Promote exclusive benefits for subscribers.
- Customer Loyalty Programs** – Reward repeat buyers to move them into the “Loyal” segment.
- Review Discount Policy** – Balance sales boosts with margin control.
- Product Positioning** – Highlight top-rated and best-selling products in campaigns.
- Targeted Marketing** – Focus efforts on high-revenue age groups and express-shipping users.